

## Reliable Uncertainty

For each detection, a neural network predicts a score that indicates the network's belief about the correctness. This score is commonly referred to as the confidence of a network. Recent work has shown that these estimates are commonly too **overconfident** [1, 2], i.e., they are miscalibrated.

## Calibration

Several methods exist to correct miscalibrated confidence scores. Our mechanism addresses this problem and aims to perform calibration w.r.t. the **additional position information** provided by a detection model. This is schematically shown in Fig. 1.

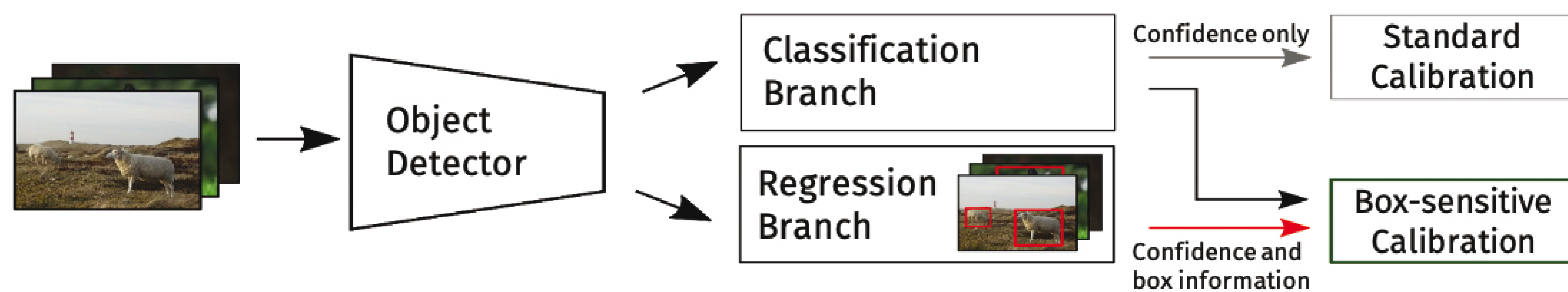


Figure 1: Concept of position-dependent confidence calibration for object detectors [1, p. 2, Figure 2].  
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## Methods

We extend the **Histogram Binning**, **Logistic Calibration**, and **Beta Calibration** methods to include additional bounding box information into calibration. These methods are trained on the TP1 KI-A SSD predictions for the TP2 KI-A validation set and evaluated on the test set. The calibration results are shown in Fig. 2-3.

## Results

We found an **underconfidence** of the examined SSD which is orthogonal to the current research in calibration. Furthermore, most predictions only have a low confidence score. Our position-dependent **Beta Calibration** re-shifts the confidence and achieves the best results to obtain calibrated confidences.

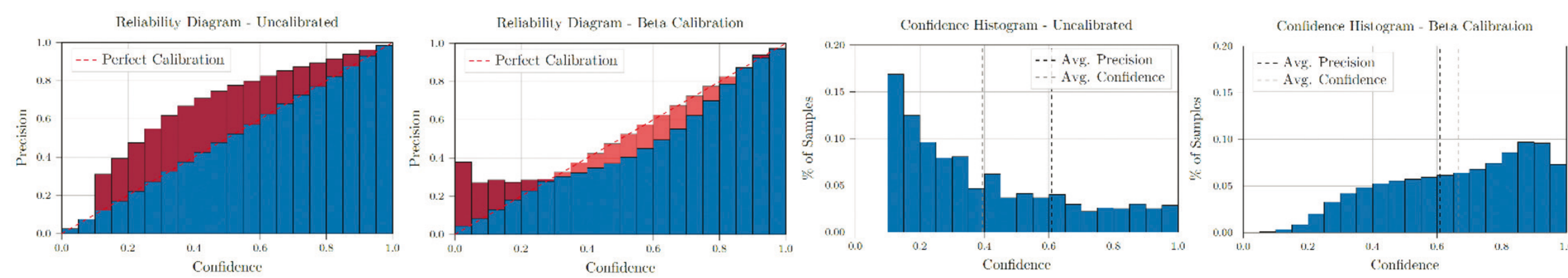


Figure 2: Figure 2: Confidence-dependent miscalibration (left column) and distribution of the confidences (right column) of the TP1 KI-A SSD before and after **Beta Calibration**.

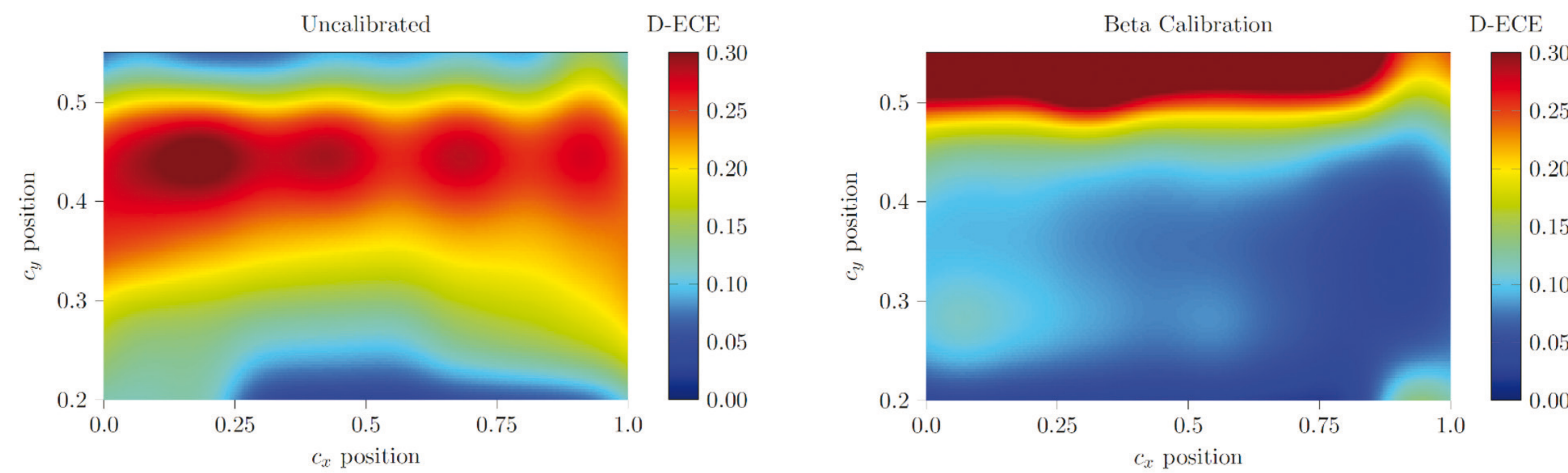


Figure 3: Position-dependent miscalibration of the TP1 KI-A SSD before (left) and after calibration by Histogram Binning, Logistic Calibration, and Beta Calibration.

## References:

- [1] Küppers, Fabian, et al. „Multivariate confidence calibration for object detection.“ Proceedings of the IEEE/CVF CVPR Workshops (SAIAD). 2020.
- [2] Guo, Chuan, et al. „On calibration of modern neural networks.“ International Conference on Machine Learning. PMLR, 2017.